



**CAPITOL**  
Technology University

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October 16, 2023

Dr. Sanjay Rai  
Secretary of Maryland Higher Education  
Maryland Higher Education Commission  
6 N. Liberty Street  
Baltimore, MD 21201

Dear Dr. Rai,

Capitol Technology University is requesting approval to offer a **Master of Science (MS) in Cyber Product Development**. The degree curriculum will be taught using a significant number of existing faculty at our university and will be supplemented by new courses supporting the **MS in Cyber Product Development**. The mission of Capitol Technology University is to provide practical education in engineering, computer science, information technology, and business that prepares individuals for professional careers and affords the opportunity to thrive in a dynamic world. A central focus of the university's mission is to advance practical working knowledge in areas of interest to students and prospective employers within the context of Capitol's degree programs. The university believes that a **MS in Cyber Product Development** is consistent with this mission.

Educational and professional organizations are reporting significant workforce shortages of trained personnel with an advanced degree and experience in leading the product development cycle, especially related to Cyber Security at the center of the Product Development lifecycle. Moreover, the shortage is growing each year with increasing demand in cyber security centered product development and the annual departure of large numbers of existing management professionals who are reaching retirement age. This program is in response to that need; the **MS in Cyber Product Development** degree is for undergraduate level graduates, experienced professionals returning for an additional graduate degree, and non-traditional students (i.e., experienced education, data, statistical personnel, management) who desire to advance in their careers by gaining leadership skills in the domain of cyber product development.

**To respond to needs of the business and management, we respectfully submit for approval the MS in Cyber Product Development. The required proposal is attached as well as the letter from me as university president confirming the adequacy of the university's library to serve the needs of the students in this degree.**

Respectfully,

Bradford L. Sims, PhD  
President



**CAPITOL**  
Technology University

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October 16, 2023

Dr. Sanjay Rai  
Secretary of Maryland Higher Education  
Maryland Higher Education Commission  
6 N. Liberty Street  
Baltimore, MD 21201

Dear Dr. Rai,

This letter is in response to the need for confirmation of the adequacy of the library of Capitol Technology University to support the proposed **Master of Science (MS) in Cyber Product Development**. As president of the university, I confirm that the library resources, including support staff, are more than adequate to support the **MS in Cyber Product Development**. In addition, the university is dedicated to, and has budgeted for, continuous improvement of its library resources.

Respectfully,

Bradford L. Sims, PhD  
President



**Cover Sheet for In-State Institutions**  
**New Program or Substantial Modification to Existing Program**

Institution Submitting Proposal


Capitol Technology University

*Each action below requires a separate proposal and cover sheet.*

- |   |   |
|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program            |
| <input type="radio"/> New Area of Concentration       | <input type="radio"/> Substantial Change to an Area of Concentration    |
| <input type="radio"/> New Degree Level Approval       | <input type="radio"/> Substantial Change to a Certificate Program       |
| <input type="radio"/> New Stand-Alone Certificate     | <input type="radio"/> Cooperative Degree Program                        |
| <input type="radio"/> Off Campus Program              | <input type="radio"/> Offer Program at Regional Higher Education Center |

Payment ☒ Yes    Payment ☐ R\*STARS # 95607  
Submitted: ☐ No    Type: ☒ Check # 95607

Payment Amount: \$850.00    Date Submitted: 10/16/23

Department Proposing Program	Graduate Department		
Degree Level and Degree Type	Master of Science (M.S.)		
Title of Proposed Program	Master of Science in Cyber Product Development		
Total Number of Credits	33		
Suggested Codes	HEGIS: 599.00	CIP: 52.9999	
Program Modality	<input type="radio"/> On-campus <input checked="" type="radio"/> Distance Education (fully online) <input type="radio"/> Both		
Program Resources	<input checked="" type="radio"/> Using Existing Resources <input type="radio"/> Requiring New Resources		
Projected Implementation Date <small>(must be 60 days from proposal submission as per COMAR 13B.02.03.03)</small>	<input type="radio"/> Fall	<input checked="" type="radio"/> Spring	<input type="radio"/> Summer    Year: 2024
Provide Link to Most Recent Academic Catalog	URL: <a href="https://catalog.captechu.edu">https://catalog.captechu.edu</a>		
Preferred Contact for this Proposal	Name: Allen Exner		
	Title: Director of Library Services and Information Literacy		
	Phone: (240) 965-2470		
	Email: <a href="mailto:ahexner@captechu.edu">ahexner@captechu.edu</a>		
President/Chief Executive	Type Name: Dr. Bradford L. Sims		
	Signature: 		Date: 10/16/2023
	Date of Approval/Endorsement by Governing Board:		10/16/2023

Revised 1/2021



**PROPOSAL FOR:**

  X   **NEW INSTRUCTIONAL PROGRAM**

       **SUBSTANTIAL EXPANSION/MAJOR MODIFICATION**

       **COOPERATIVE DEGREE PROGRAM**

  X   **WITHIN EXISTING RESOURCES** or        **REQUIRING NEW RESOURCES**



**Institution Submitting Proposal**

**January 2024**

**Projected Implementation Date**

**Master of Science  
(M.S.)  
Award to be Offered**

**0599**

**Suggested HEGIS Code**

**Master of Science in  
Product Development  
Title of Proposed Program**

**52.9999**

**Suggested CIP Code**

**Graduate Programs  
Department of Proposed Program**

**Dr. Eric Motycka  
Director, Graduate Programs**

**Mr. Allen Exner  
Director of Library  
Services; MHEC  
Coordinator**

**ahexner@captechu.edu  
Contact E-Mail Address**

**240-965-2470  
Contact Phone Number**

 **10-16-23**  
**Signature and Date**

**President/Chief Executive Approval**

 **OCT. 16, 2023**  
**Date**

**Date Endorsed/Approved by Governing Board**

**Proposed Master of Science in Cyber Product Development**  
**Department of Graduate Programs**  
**Capitol Technology University**  
**Laurel, Maryland**

**A. Centrality to Institutional Mission and Planning Priorities:**

- 1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.**

*Master of Science in Cyber Product Development Program Description:*

The **Master of Science (M.S.) in Cyber Product Development** provides students with the opportunity to conduct extensive and sustained graduate level learning at an advanced level in the field of Product Development focused on the need for Cyber Security to be at the center of the Product Development process. Product Development has evolved recently to a hybrid of scientific reasoning and research, cyber security features, business management, cutting-edge technology, operational analysis, marketing, supply, logistics, and sustainability. The **MS in Cyber Product Development** is a unique master's degree program designed to meet the demands of the highly skilled professionals who want to become the leaders who will be involved in the advancement, expansion, and support of Product Development on both a large and small scale.

The **MS in Cyber Product Development** is for current professionals in the field who desire to increase their skills to an advanced level and become leaders in Product Development. The **MS in Cyber Product Development** also provides a path for personnel in the Product Development field to explore new ground as this section of the industry faces revolutionary changes in highly competitive local, national, and global markets.

The University is in a unique position to provide those students with an avenue to pursue a deep proficiency in this area using an interdisciplinary methodology, courses offered, and the skill set of the faculty. Graduates will return to the Product Development field with new knowledge and ideas to help the sector progress as it rapidly evolves by employing new technology, techniques, and materials. This degree is for current professionals in the field who desire to elevate their skills to an advanced level in the field.

The **MS in Cyber Product Development** program is designed for experienced professionals in the Product Development field with a bachelor's degree and at least three years of experience. During the program, students will conduct project-oriented and cyber produce development research and work in an approved area of Product Development. Successful completion of the program culminates in the award of the **MS in Cyber Product Development** degree.

*Relationship to Institutional Approved Mission:*

The **MS in Cyber Product Development** is consistent with the University mission to educate individuals for professional opportunities in engineering, computer science, information technology, and business. The University provides relevant learning experiences that lead to

success in the evolving global community. The **MS in Cyber Product Development** is consistent with that philosophy. This same philosophy is supported by the University's existing degree programs and learning opportunities. The **MS in Cyber Product Development** degree is an integral part of the Strategic Plan for FY 2017-2025 and succeeding years. Funding to support the new degree has been included in the institutional and departmental budgets for FY 2023-2024 and forecasted budgets going forward.

The **MS in Cyber Product Development** degree will be offered online using the Canvas Learning Management System and Adobe Connect. The result is the convenience required by the 21<sup>st</sup> Century learner and provides the interaction with faculty and fellow students that is critical to the high-level learning experience. The curriculum provides the master's student the necessary learning tools that the University believes critical to success in the Product Development sector. The degree is also consistent with the interdisciplinary nature of the University.

**2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.**

Capitol Technology University operates on four strategic goals:

- 1. Expand Educational Offerings, Increase Program Completion:** *Capitol Technology University is an institution that offers career-relevant curricula with quality learning outcomes. The strategy includes continuing to expand educational offerings, increasing program completion, and raising learner qualifications and outcomes.*
- 2. Increase Enrollment and Institutional Awareness:** *Capitol will accelerate its goal pursuit to become more globally renowned and locally active through student, faculty and staff activities. Enrollment will grow to 650 undergraduates, 350 masters' students and 250 doctoral candidates.*
- 3. Improve the Utilization of University Resources and Institutional Effectiveness While Expanding Revenue:** *Capitol will likely continue to be 80% financially dependent on student tuition and fees. We plan to enhance our resources by expanding the range and amount of funding from other streams and aligning costs with strategic initiatives.*
- 4. Increase the Number and Scope of Partnerships:** *Capitol's service to our constituents and sources of financial viability both depend upon participation with continuing and new partner corporations, agencies, and schools.*

The **MS in Cyber Product Development** program supports all the University's four strategic goals. The proposed degree builds upon the existing areas of degrees at the undergraduate level: B.S. in Astronautical Engineering, B.S. in Aviation Professional Pilot, B.S. in Computer Engineering, B.S. in Computer Engineering Technology, B.S. in Computer Science, B.S. in Construction Information Technology and Cybersecurity, B.S. in Construction Management and Critical Infrastructure, B.S. in Construction Safety, B.S. in Counterterrorism, B.S. in Cyber Analytics, B.S. in Cybersecurity, B.S. in Data Science, B.S. in Electrical Engineering, B.S. in Electrical Engineering Technology, B.S. in Engineering Technology, B.S. in Facilities Management and Critical Infrastructure, B.S. in Information Technology, B.S. in Management of Cyber and Information Technology, B.S. in Mechatronics Engineering, B.S. in Mechatronics and Robotics Engineering Technology, B.S. in Software Engineering, and B.S. in Technology and

Business Management, B.S in Unmanned and Autonomous Systems, and B.S. in Web Development.

The proposed degree also supports the existing areas of degrees of graduate study, including the Master of Business Administration (M.B.A.), Master of Science (M.S.) in Astronautical Engineering, M.S. in Aviation, M.S. in Aviation Cybersecurity, M.S. in Computer Science, M.S. in Construction Cybersecurity, M.S. in Construction Safety, M.S. in Critical Infrastructure, M.S. in Cyber Analytics, M.S. in Cybersecurity, M.S. in Information Systems Management, M.S. in Engineering Technology, M.S. in Internet Engineering, M.S. in Unmanned and Autonomous Systems Policy and Risk Management, Technical Master of Business Administration (T.M.B.A.) in Business Analytics and Data Science, and T.M.B.A. in Cybersecurity, Doctor of Science (D.Sc.) in Cybersecurity, Doctor of Philosophy (Ph.D.) in Artificial Intelligence, Ph.D. in Aviation, Ph.D. in Business Analytics and Data Sciences, Ph.D. in Construction Science, Ph.D. in Critical Infrastructure, Ph.D. in Cybersecurity Leadership, Ph.D. in Emergency and Protective Services, Ph.D. in Human Factors, Ph.D. in Manufacturing, Ph.D. in Occupational Health and Safety, Ph.D. in Product Development, Ph.D. in Quantum Computing, Ph.D. in Technology, Ph.D. in Technology/M.S. Research Methods Combination Program, Ph.D. in Unmanned Systems Applications.

The University's programs have been preparing professionals for the rapid advances in information technology, intense global competition, and increasingly sophisticated technological environments for decades. The **MS in Cyber Product Development** follows that tradition.

The proposed **MS in Cyber Product Development** is fully supported by the University's Vision 2025 and Strategic Plan 2017-2025. Funding to support the **MS in Cyber Product Development** is already available within the existing budget.

The University has active partnerships in the private and public areas (e.g., Parson Corporation, Leidos, Patton Electronics, Lockheed Martin, Northrup Grumman, Cyber Security Forum Initiative, Internal Revenue Service, and National Cryptologic School). The **MS in Cyber Product Development** degree will provide new opportunities for partnerships. The increase in alliances and the placement of our graduates in our partner institutions will serve to expand the University's enrollment and reputation. While additional students will increase financial resources, new partnerships, and grants in the Product Development field will help diversify and increase financial resources.

**3. Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation. (Additional related information is required in section L.)**

Capitol Technology University will support the proposed program through the same process and level of support as the University's existing programs. The University has also budgeted funds to support program and course development, online support, office materials, travel, professional development, and initial marketing. There is no substantial impact to the institution due to the advanced budgeting of these funds. If approved, the program will be self-sustaining going forward.

**4. Provide a description of the institution's a commitment to:**

**a. Ongoing administrative, financial, and technical support of the proposed program**

The proposed degree is an integral part of the University's Strategic Plan for FY 2017-2025 and forward. The institutional and departmental budgets for FY 2020-2021, as well as the forecasted budgets going forward, include funding for the administrative, financial, and technical support of the new degree.

**b. Continuation of the program for a period of time sufficient to allow enrolled students to complete the program.**

Capitol Technology University is fully committed to continuing the **MS in Cyber Product Development** degree program for a sufficient period to allow enrolled students to complete the program.

**B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan:**

**1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general based on one or more of the following:**

**a. The need for advancement and evolution of knowledge.**

Leaders in the Product Development sector are facing an ever-increasing need to expand the application of new technology to their industry in order to remain competitive, efficient, and viable now and in the future. Product Managers today depend and thrive on timely, accurate and relevant information to deliver a fully developed product that meets the current and projected needs of their target market and users. As technology enables the creation and capture of ever-increasing amounts of data, especially user-experience data, the effective leadership, management, and understanding of resource needs and user needs is becoming an enormous challenge.

Product Development has undergone a tremendous transformation from its original application and practice as a particular company's management of the marketplace appeal of a single, commercial brand. Now, at its highest levels, Product Development has evolved recently to the unification of cutting-edge, scientific reasoning and research, the less-exact realm of marketing, and the rigorous field of business management. Product Development is no longer simply the task of bringing a product to market and managing its consumer appeal. Product Development now has far-reaching implications in the global, environmental, integration, and security aspects of society. The leaders in the Product Development field are constantly developing new solutions, new markets and new techniques to survive and thrive. Effective leadership in this industry can be achieved only with a holistic approach and the advanced skills that will be covered in this proposed degree.

The State of Maryland has a long history of fostering and encouraging business ventures as well as blazing new trails with groundbreaking research. If approved, this new degree will build on that legacy with a groundbreaking new master's program in a field that is evolving due to rapidly changing technology and applications. The University's **MS in Cyber Product Development** program will produce the next generation of managers and leaders with the technological expertise needed now and in the future by the Product Development



industry.

**b. Societal needs, including expanding educational opportunities and choices for minorities and educationally disadvantaged students at institutions of higher education.**

Capitol Technology University is a diverse multiethnic and multiracial institution with a long history of serving minority populations. The University has a 51% minority student population with 7% undisclosed. The Black/African American population is 34%. The university has military/veteran population of 22%. The University also has a 22% female population – a significant percentage given its status as a technology institution. If approved, the proposed **MS in Cyber Product Development** will expand the field of opportunities for minorities and disadvantaged students.

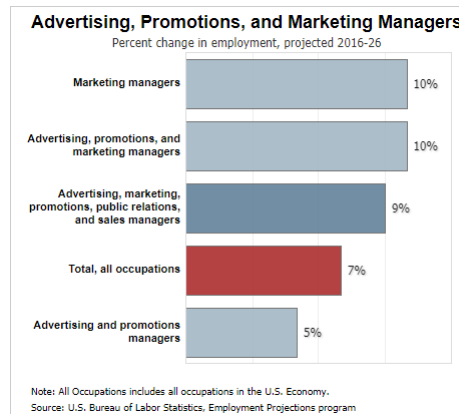
The Bureau of Labor Statistics Occupational Outlook Handbook does not break out Product Development as a separate occupation yet, despite petitions to do so. Currently, relevant BLS statistics are available for Advertising, Promotions and Marketing Managers.

(Source: <https://www.bls.gov/ooh/management/advertising-promotions-and-marketing-managers.htm>)

Employment of 249,600 business leaders and managers is projected to grow 10 percent by 2026, faster than the average for all occupations.

As the ability to track and interact with individual users and consumers becomes more granular and (most-importantly) quantifiable, a significant number of the highest-qualified leaders in Product Development will be needed. Over the coming decade, technological change, along with population and business growth will result in both increased globalization and increased individuation. Also, the need to improve portions of the national infrastructure is expected to spur employment growth as roads, bridges, and sewer pipe systems are upgraded or replaced.

To ensure that product-management projects are completed on time and under budget, firms require highly capable Product Development leaders with the latest knowledge and skills. Product Development processes and consumer-marketing technology are rapidly becoming more complex. The next generation of leaders at the highest-levels in Product Development will need a new level of knowledge, combination of multiple management skills, greater oversight abilities, and a much higher level of technological expertise.



(Source: <https://www.bls.gov/ooh/management/advertising-promotions-and-marketing-managers.htm#tab-6>)

**c. The need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs.**

While Capitol Technology University is not a historically black institution, the university is a diverse multiethnic and multiracial institution with a long history of serving minority populations. The University has a 51% minority student population with 7% undisclosed. The Black/African American population is 34%. The University has a military/veteran population of 22%. The university also has a 22% female population – a significant percentage given its status as a technology institution. If approved, the proposed **MS in Cyber Product Development** will expand the field of opportunities for minorities and disadvantaged students.

The industry watchdog, Diverse: Issues In Higher Education, serves as a source of critical news, information and insightful commentary on the full range of issues concerning diversity in American higher education. The group cites recent U.S. Bureau of Labor Statistics information regarding the inequity of high paying jobs in technology. “Yet, women and minorities are not accessing these jobs at anywhere near a proportionate rate. For instance, a report from the Business-Higher Education Forum notes that African Americans and Hispanics represent just 6 and 7% respectively of STEM employment, even though they represent more than twice that much of the U.S. population.” An examination of the percentages in the Professional and Business Services field shows Hispanics fare significantly better, but African American employment is only at a disappointing 10.2 percent.

Industry	2022				
	Percent of total employed				
	Women	White	Black or African American	Asian	Hispanic or Latino
Professional and Business Svcs.	42.4	77.0	10.2	9.7	16.9

(Source: <https://www.bls.gov/cps/cpsaat18.htm>, accessed 10/6/20223)

Given the substantial minority population of Capitol Technology University, it is reasonable to assert that the **MS in Cyber Product Development** program will add to this base of minority participation in the Product Development industry.

**2. Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education.**

The 2022 Maryland State Plan for Postsecondary Education articulates three goals for postsecondary education:

1. **Access:** Ensure equitable access to affordable and high-quality postsecondary education for all Maryland residents.

2. **Success:** Promote and implement practices and policies that will ensure student success.
3. **Innovation:** Foster innovation in all aspects of Maryland higher education to improve access and student success.

### **Goal 1: Student Access**

***"Ensure equitable access to affordable and quality postsecondary education for all Maryland residents."***

Capitol Technology University is committed to ensuring equitable access to affordable postsecondary education for all Maryland residents. The University meets its commitment in this arena through its diverse campus environment, admissions policies, and academic rigor.

- **Priority 1:** Study the affordability of postsecondary education in Maryland.
- **Priority 2:** Examine and improve financial literacy programs for students and families to encourage financial planning to pay for postsecondary education.
- **Priority 3:** Analyze systems that impact how specific student populations access affordable and quality postsecondary education.

The Capitol Technology University community is committed to creating and maintaining a mutually respectful environment that recognizes and celebrates diversity among all students, faculty, and staff. The University values human differences as an asset and works to sustain a culture that reflects the interests, contributions, and perspectives of members of diverse groups. The University delivers educational programming to meet the needs of diverse audiences. We also seek to instill those values, understanding, and skills to encourage leadership and service in a global multicultural society.

The composition of the University's student body reflects the institution's commitment to diversity. Capitol Technology University has a 51% minority student population, with 7% undisclosed. The Black/African American population is 34%. The University has a military/veteran population of 22%. The University also has a 22% female population – a significant percentage given its status as a technology university.

Achievement gaps: The University provides leveling courses in support of individuals attempting a career change to a field of study not necessarily consistent with their current skills. There are situations where undergraduate courses best serve student needs in subject areas. The University makes those courses available.

The University engages in diversity training for its institutional population, including students. Diversity and inclusiveness are built into the curriculum allowing graduates to operate effectively in a global environment. The University supports multiple diversity enhancing actions, including team projects and grants across degrees. This has proven effective at supporting numerous aspects of diversity.

Capitol Technology University does not discriminate on the basis of race, color, national origin, sex, age, sexual orientation, or handicap in admission, employment, programs, or activities.

Through its academic programs, Capitol Technology University seeks to prepare all of its graduates to demonstrate four primary characteristics:

- **Employability:** The ability to enter and advance in technical and managerial careers, appropriate to their level and area of study, immediately upon graduation.
- **Communications:** Mastery of traditional and technological techniques of communicating ideas effectively and persuasively.
- **Preparation of the Mind:** The broad intellectual grounding in technical and general subjects required to embrace future technical and managerial opportunities with success.
- **Professionalism:** Commitment to life-long learning, ethical practice, and participation in professions and communities.

The proposed **MS in Cyber Product Development** program and University financial aid will be available to all Maryland residents who qualify academically for admission. The University has successfully managed to support Financial Aid for its students since its founding in 1927.

The **MS in Cyber Product Development** program, with its academic rigor, will produce highly qualified Product Development managers and leaders with the skills and abilities to advance their careers. The University has a proven record of rigorous high-quality education in all of its degrees. The University is fully accredited by four accrediting organizations. The University receives its regional accreditation from the Middle States Commission on Higher Education (MSCHE). The University also has specialized accreditation from the Accreditation Board for Engineering and Technology (ABET), National Security Agency (NSA), and Department of Homeland Security (DHS). The **MS in Cyber Product Development** program is consistent with the MSCHE criteria for regional accreditation of the delivery of high-quality higher education.

## **Goal 2: Student Success**

***“Promote and implement practices and policies that will ensure student success.”***

The courses for the **MS in Cyber Product Development** degree will be offered online using the Canvas Learning Management System and Zoom. The University provides a tuition structure that is competitive with its competitors. The University tuition structure does not differentiate between in-state and out-of-state students. The University’s Student Services provide advising, tutoring, virtual job fair attendance, and other activities supporting student completion and employment for both on-ground and online students.

Students receive information throughout the admissions process regarding the cost to attend the University. The information is also publicly available on the University website. The University’s Admissions Office and Office of Financial Aid identify potential grants and scholarships for each student. The Office of Financial Aid also provides plans for each student to reduce potential student debt. The net cost versus gross costs is identified clearly for the student. Students receive advising from Financial Aid Advisors before enrolling in classes for the first time. Admissions personnel, Student Services Counselors, and Departmental Chairs advise students of the need for academic readiness as well as the degree

requirements. Academic Advisors also develop a specific success pathway for each student.

The University's tuition increases have not exceeded 3%. The University also has a tuition guarantee for undergraduates, which means full-time tuition is guaranteed not to increase more than 1% per year above the rate at the time of initial enrollment. The tuition remains at this rate if the student remains enrolled full-time without a break in attendance.

The University provides services and learning tools to guide students to successful degree completion. Programs such as Early Alert give the University's faculty and staff opportunities for early student intervention on the pathway to graduation. This program applies to all students regardless of the mode of course delivery or degree program. Capitol Technology University is also a transfer-friendly institution and participates in multiple programs for government and military credit transfer. Capitol Technology University participates in the Articulation System for Maryland Colleges and Universities (ARTSYS) and has numerous transfer agreements with local institutions at all degree levels.

The University has in place services, tutoring, and other tools to help ensure student graduation and successful job placement. The University hosts a career (job) fair twice a year. The University has an online career center available to all students covering such topics as career exploration, resume writing, job search techniques, social media management, mock interviews, and assistance interpreting job descriptions, offers, and employment packages.

The University also works with its advisory boards, alumni, partners, and faculty to help ensure the degrees offered at the University are compatible with long-term career opportunities in support of the state's knowledge-based economy.

### **Goal 3: Innovation**

***“Foster innovation in all aspects of Maryland higher education to improve access and student success.”***

Capitol Technology University's past, present, and future are inextricably intertwined with innovation. The University has a long tradition of serving as a platform for the use of new and transformative approaches to delivering higher education. New technology and cutting-edge techniques are blended with proven strategies to enable student success in all classroom modalities as well as in a successful career after graduation. As a small institution, Capitol Technology University has the agility to rapidly integrate new technologies into the curriculum to better prepare students for the work environment. The University designs curriculum in alliance with its accreditation and regulating organizations and agencies.

The University also employs online virtual simulations in a game-like environment to teach the application of knowledge in a practical hands-on manner. The University engages with a partner creating high-level virtual reality environments for use by students pursuing this degree. This use of current technology occurs in parallel with traditional, proven learning strategies. These elements of the University's online learning environment are purposeful and intended to improve the learning environment for both the student and faculty member. The approach is intentionally designed to increase engagement, improve outcomes, and improve retention and graduation rates. The University believes that innovation is the key to successful student and faculty engagement.



Example: The University engages its students in fusion projects that allow students to contribute their skills in interdisciplinary projects such as those in our Astronautical Engineering and Cyber Labs. In those labs, students become designers, builders, and project managers (e.g., to send a CubeSat on a NASA rocket) and data analysts (e.g., to analyze rainforest data for NASA). The University's students recently launched their latest satellite aboard a NASA rocket from a location in Norway at the beginning of the 2019 Fall Semester. We are also recruiting additional partners for the proposed **MS in Cyber Product Development** for which real-world projects will provide students integrative learning opportunities in the Product Development field.

The University also supports prior learning assessment. Portfolio analysis is available. The University accepts professional certifications for credit for specific courses. The University also allows students to take a competency exam for credit for required courses up to the current state limits.

### **C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State:**

#### **1. Describe potential industry or industries, employment opportunities, and expected level of entry (*ex: mid-level management*) for graduates of the proposed program.**

Graduates with the **MS in Cyber Product Development** degree will be expected to fill managerial and leadership positions in commercial companies as well as local, state, and federal governments with a variety of titles such as:

- Manager, Product Development
- Product Development Scientist
- Manager, New Product Development
- Director, Channel and Product Development
- Manager, Products
- Manager, Product Line
- Product Development Officer
- Product Development Strategist
- Business Development Consultant, Product Development
- Product Development Consultant

Graduates from the proposed **MS in Cyber Product Development** program will possess the latest knowledge in the Product Development field as Cyber Security becomes central to all product development. They will serve as subject matter experts, and possess the ability to perform as leaders and managers in their industry.

#### **2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.**

The emerging Product Development sector blends multiple traditional business fields into a single capability. Product Development professionals analyze all available data to improve business operations, supply chains, pricing models, and marketing. A primary driver for this hybrid area is the role of software development in the marketplace. An article published by the Harvard Business Review states “software is emerging as the proving ground for the future of

management practices, the way auto manufacturing used to be the proving ground for new management practices.”

(Source: <https://hbr.org/2014/06/how-the-software-industry-redefines-product-management>)

The new digital proving ground has grown even more important in the last five years as software development is critical for the future of smartphones, the Internet of Things and in-home, digital assistants – the most popular products being purchased. Recent research illustrates the need for Cybersecurity to be the central component of new product development.

(Source: <https://hbr.org/2023/05/cybersecurity-needs-to-be-part-of-your-products-design-from-the-start>)

All of this bodes well for a positive, expanding future for Product Development with a focus on the centering of cybersecurity in the product development process, with the highest technological skills and abilities. The Bureau of Labor Statistics does not break out Product Development as a separate occupation yet, despite petitions to do so. However, current, relevant BLS statistics are available for Advertising, Promotions and Marketing Managers, for Software Developers and for Operations Research Analysts.

In its analysis of the prospects for Advertising, Promotions and Marketing managers, BLS emphasizes that “managers who can navigate the digital world should have the best prospects.” BLS forecasts 6% growth in jobs for this category from 2022 to 2032, greater than average for all occupations.

“Advertising, promotions, and marketing manager positions are highly desirable and are often sought by other managers and experienced professionals. With Internet-based advertising becoming more important, advertising managers who can navigate the digital world should have the best prospects,” according to the Bureau of Labor Statistics. (Source: <https://www.bls.gov/ooh/management/advertising-promotions-and-marketing-managers.htm>)

For personnel with software development expertise, BLS projects an employment growth rate of 25% from 2022 to 2032. This type of strong, double-digit growth fits with the need for Product Development expertise at the highest levels. Product Development has shed its old mode and now includes the requirement for expertise in software development and cybersecurity to maintain an edge on the competition and to protect consumers and overall critical infrastructure. “The need for new applications on smartphones and tablets will help increase the demand for applications software developers,” writes BLS. Those applications, in turn, provide highly useful data that can be used to great advantage by the highest-level Product Development professionals who lead groups of products into a successful future. (Source: <https://www.bls.gov/ooh/computer-and-information-technology/software-developers.htm#tab-6>)

Within the Product Development realm, the analytical skills of a high-level product developer are infused with the skills of operations research analysis. The operational research analysis skills “use advanced mathematical and analytical methods to help organizations investigate complex issues, identify and solve problems, and make better decisions,” according to BLS. The growth projections from 2022 to 2032 for the single category of Operations Research Analysts is 23%, much faster than average.

(Source: <https://www.bls.gov/ooh/math/operations-research-analysts.htm>)

The forecasted growth rates for Product Development-related BLS occupational categories are all in the double digits—well above the overall BLS-projected growth of 7% for all jobs by 2026.

These strong growth projections bode well for the growth in demand for Product Development professionals with highest-level skills. The projections highlight the need for individuals who have a focused terminal degree, such as the University's proposed **MS in Cyber Product Development**.

**3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.**

Product Development and Product Manager is the natural expansion of, and an improvement on, the 20<sup>th</sup> Century's version of the brand manager. As such, Product Development is still relatively new in terms of industry classification by the government.

At the same time, there are well-established professional associations and academic institutions that have demonstrated their active involvement in developing the educational and training needs of the Product Development industry. High demand is evident with Glassdoor ranking Product Manager as the 10<sup>th</sup> most popular job with 17,725 openings as of 10/6/2023. (Source: [https://www.glassdoor.com/List/Best-Jobs-in-America-LST\\_KQ0,20.htm](https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm); accessed 10/6/2023)

One of the leading proponents of increased education and training for product development and management is the Product Development and Management Association (PDMA), which began in 1976. The first issue of PDMA's journal, the Journal of Product Innovation and Management (JPIM), was published in 1984.

In 2011, the PDMA, with the co-sponsorship of the University of Illinois at Chicago, convened its inaugural Doctoral Consortium. The PDMA's journal, the Journal of Product Innovation Management, reported in early 2012 on this inaugural event.

(Source: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1540-5885.2012.00903.x>)

In terms of educational and training needs, the PDMA Doctoral Consortium is an event that seeks to “enhance the development of doctoral students who are conducting dissertation research in the domain of innovation and new product development.”

In 2017, the Doctoral Consortium was co-sponsored by the University of New Hampshire's Paul College and the PDMA. (Source: <https://www.unh.edu/unhtoday/2017/10/internationally-renowned>)

In 2019, the fourth, triennial meeting of the Doctoral Consortium was held in Champaign, Illinois. The event is co-sponsored by the University of Illinois at Urbana Champaign (UIUC) and the Product Development and Marketing Association (PDMA).

(Source: <https://www.pdma.org/events/EventDetails.aspx?id=1169752&hhSearchTerms=%22Doctoral+and+Consortium%22>)

The BLS Employment Projections for Advertising, Promotions, and Marketing managers and Software Developers are shown below. The largest number of vacancies will be with Software Developers; BLS forecasts 255,400 new jobs will become available through 2026.

**Employment projections data for advertising, promotions, and marketing managers, 2016-26**

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Advertising, promotions, and marketing managers	—	249,600	273,400	10	23,800	—
Advertising and promotions managers	11-2011	31,300	33,000	5	1,700	 <a href="#">xlsx</a>
Marketing managers	11-2021	218,300	240,400	10	22,100	 <a href="#">xlsx</a>

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

**Employment projections data for software developers, 2016-26**

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Software developers	—	1,256,200	1,558,700	24	302,500	—
Software developers, applications	15-1132	831,300	1,086,600	31	255,400	 <a href="#">xlsx</a>
Software developers, systems software	15-1133	425,000	472,100	11	47,100	 <a href="#">xlsx</a>

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

A McKinsey & Company article published in 2017, “Product managers for the digital world,” had this description of the near-future, projected need for product managers:

Over the next three to five years, we see the product-management role continuing to evolve toward a deeper focus on data (without losing empathy for users) and a greater influence on non-product decisions.

Product managers of the future will be analytics gurus and less reliant on analysts for basic questions. They will be able to quickly spin up a Hadoop cluster on Amazon Web Services, pull usage data, analyze them, and draw insights.”

(Source: <https://www.mckinsey.com/industries/high-tech/our-insights/product-managers-for-the-digital-world>)

#### 4. Data showing the current and projected supply of prospective graduates.

According to GMAC’s annual Corporate Recruiters Survey Report, more than 50% of the recruiters surveyed reported they plan to hire personnel with a graduate management degree. That statistic has held steady over the last five years but has almost tripled from 18% ten years ago. The key characteristics that employers are looking for in their prospective leaders are business development, data analytics, and marketing. All three job functions are capabilities embedded in the **MS in Cyber Product Development** program.

If approved, the **MS in Cyber Product Development** will send its graduates to managerial and leadership positions in industry, academia, and government with the ability to chart the course of their organization and its success in the future. The program graduates will be in the position to earn a rewarding income in the Product Development field.

### D. Reasonableness of Program Duplication

#### 1. Identify similar programs in the State and/or same geographical area. Discuss similarities

**and differences between the proposed program and others in the same degree to be awarded.**

There are no master's degree programs in Product Development programs in the State of Maryland. However, there are a wide variety of master's degrees in much broader areas of business and management across the state. The University System of Maryland (USM) has M.B.A. programs at five of its campuses [Bowie State University (BSU), Frostburg State University (FSU), Morgan State University (MSU), Salisbury University (SU), University of Baltimore (UB), and University of Maryland College Park (UMCP)]; some of those M.B.A. programs offer formal Areas of Emphasis or Concentrations in a primary area of business (e.g., Accounting, Entrepreneurship, Finance, Marketing, Project Management, Supply Chain Management, etc.). The USM also has five universities [MSU, UB, University of Maryland Baltimore County (UMBC), UMCP, and University of Maryland Global Campus (UMGC)] that offer a Master of Science (M.S.) in Management (with 13 formal Specializations), a sector of Management (e.g., Construction Management, Hospitality Management, Project Management, Health Systems Management, Negotiations and Conflict Management, Supply Chain Management, Engineering Management, etc.), or a primary area of business (e.g., Accounting, Business and Management, Business Analytics, Entrepreneurship, Finance, Information Systems, Marketing, Marketing Analytics, Project Management, Quantitative Finance, Supply Chain Management, etc.). UMBC also offers a Master of Arts (M.A.) in Management of Aging Services, Master of Professional Studies (M.P.S.) in Entrepreneurship, Innovation, and Leadership, and M.P.S. in Technical Management. Additionally, UMBC has a 12-credit Post Baccalaureate Certificate (PBC) in Integrated Product Development and Manufacturing. USM and UMCP also have a Professional Certificate in Product Development that if offered through the Massive Open Online Course (MOOC) provider called "edX." Across the state's private universities and colleges, seven institutions offer an M.B.A. Additionally, eight of the private universities and colleges offer additional master's degrees (e.g., M.A., M.S., etc.) in a sector of management or primary business area. Capitol Technology University's proposed MS in Cyber Product Development is different from the other degrees offered. The university's proposed MS in Cyber Product Development is narrowly focused on Product Development and focused on Cyber Security as a central component of the product development cycle. It is also directly aligned with the Product Development and Management Association's (PDMA) New Product Development Professional (NPDP) Certification.

## **2. Provide justification for the proposed program.**

The proposed **MS in Cyber Product Development** program is strongly aligned with the University's strategic priorities and is supported by adequate resources. The proposed **MS in Cyber Product Development** degree will strengthen and expand upon the existing technology, management, and applied engineering degree programs at the University. In addition, the **MS in Cyber Product Development** program will be an option for all students as the field integrates well with the market needs of the University's other programs. There is a thorough discussion of the need for the program in Sections B and C of this document.

## **E. Relevance to high-demand programs at Historically Black Institutions (HBIs):**

### **1. Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBIs.**



The University does not anticipate any impact on the implementation or maintenance of high-demand programs at HBIs. There are no master's degree programs in Product Development programs in the State of Maryland. However, two of the HBIs offer degrees in other areas of business and management. Bowie State University (BSU) and Morgan State University (MSU) both offer an M.B.A. MSU's M.B.A. also allows the student to focus on one of six Areas of Emphasis (i.e., Accounting, Entrepreneurship, Finance, Marketing, Project Management, and Supply Chain Management.) Additionally, MSU offers M.S. degrees in Construction Management, Hospitality Management, and Project Management.

**F. Relevance to the identity of Historically Black Institutions (HBIs):**

**1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs.**

The University does not anticipate any impact on the uniqueness and institutional identities and missions of HBIs. There are no master's degree programs in Product Development programs in the State of Maryland. However, two of the HBIs offer ma's degrees in other areas of business and management. Bowie State University (BSU) and Morgan State University (MSU) both offer an M.B.A. MSU's M.B.A. also allows the student to focus on one of six Areas of Emphasis (i.e., Accounting, Entrepreneurship, Finance, Marketing, Project Management, and Supply Chain Management.) Additionally, MSU offers M.S. degrees in Construction Management, Hospitality Management, and Project Management.

**G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes (as outlined in COMAR 13B.02.03.10):**

**1. Describe how the proposed program was established, and also describe the faculty who will oversee the program.**

The University's New Programs Group established the proposed program through a rigorous review of unmet needs. The group includes selected representation from the University's faculty, administrators, and Executive Council. Please see Section I for a detailed list of the faculty's backgrounds and qualifications.

**2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and (modality) of the program.**

*Educational Objectives:*

1. Students will develop a cyber security centered, comprehensive product development and management strategy for a unique, superior product that delivers a compelling value proposition to the customer.
2. Students will demonstrate an advanced ability to use market research methods and techniques to create new products.
3. Students will analyze successful market-driven, customer-focused product development processes.
4. Students will demonstrate a superior ability to apply the tools and metrics that are required to underpin a successful new product process.

5. Students will develop portfolio Product Development plans in a cross-functional manner that encompasses the development of new products through to launch and an on-going review of existing products to ensure optimal alignment with strategy and resource availability.
6. Students demonstrate advanced knowledge of the stages of the product life cycle, including Product Development, cyber security focused product development, and product development strategies for each stage.
7. Students will demonstrate a superior understanding of sustainability with specific emphasis on sustainable innovation as applied to innovation strategy and product design.

*Learning Outcomes:*

Upon graduation:

- a. Graduates will be able to demonstrate mastery in comprehensive, cyber security grounded, product development and management strategies for unique, superior products that deliver compelling value propositions to the customer.
- b. Graduates will be able to employ advanced market research methods and techniques to create new products.
- c. Graduates will be able to develop and implement sophisticated portfolio Product Development plans in a cross-functional manner.
- d. Graduates will be able to employ effective and efficient product development strategies for each stage of the product life cycle.
- e. Graduates will be able to utilize their knowledge and skills of Cyber Product Development to emphasize sustainable innovation as applied to innovation strategy and product design.

**3. Explain how the institution will:**

**a) Provide for assessment of student achievement of learning outcomes in the program**

Capitol Technology University will assess student achievement of the learning outcomes per the regulations and requirements specified by the university's regional accreditation organization, the Middle States Commission on Higher Education (MSCHE), and the Product Development and Management Association's (PDMA) New Product Development Professional (NPDP) Certification.

Under MSCHE, the University will use Standard V, Educational Effectiveness Assessment, of the Standards for Accreditation and Requirements of Affiliation. Standard V requires:

Assessment of student learning and achievement demonstrates that the institution's students have accomplished educational goals with their program of study, degree level, the institution's mission, and appropriate expectations for institutions of higher education.

(Source: <https://www.msche.org/?Nav1=About&Nav2=FAQ&Nav3=Question07>)

Per the MSCHE's accreditation requirements, Capitol Technology University will measure Standard V by using the following criteria:

An accredited institution possesses and demonstrates the following attributes or activities:

1. clearly stated educational goals at the institution and degree/program levels, which are interrelated with one another, with relevant educational experiences, and with the institution's mission:

2. organized and systematic assessments, conducted by faculty and/or appropriate professionals, evaluating the extent of student achievement of institutional and degree/program goals. Institutions should:

- a. define meaningful curricular goals with defensible standards for evaluating whether students are achieving those goals;
- b. articulate how they prepare students in a manner consistent with their mission for successful careers, meaningful lives, and, where appropriate, further education. They should collect and provide data on the extent to which they are meeting these goals;
- c. support and sustain assessment of student achievement and communicate the results of this assessment to stakeholders;

3. consideration and use of assessment results for the improvement of educational effectiveness. Consistent with the institution's mission, such uses include some combination of the following:

- a. assisting students in improving their learning;
- b. improving pedagogy and curriculum;
- c. reviewing and revising academic programs and support services;
- d. planning, conducting, and supporting a range of professional development activities;
- e. planning and budgeting for the provision of academic programs and services;
- f. informing appropriate constituents about the institution and its programs;
- g. improving key indicators of student success, such as retention, graduation, transfer, and placement rates;
- h. implementing other processes and procedures designed to improve educational programs and services;

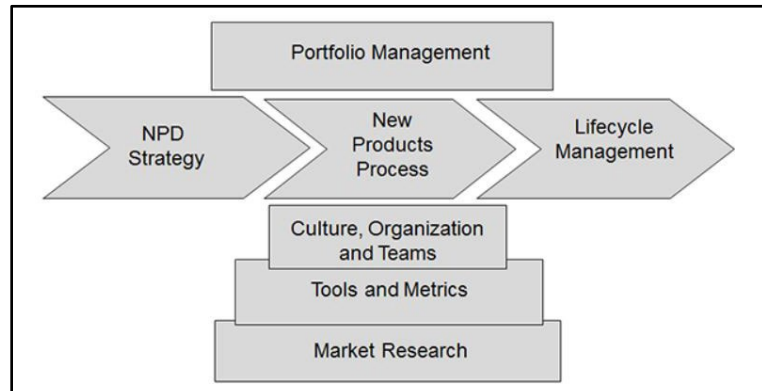
4. if applicable, adequate and appropriate institutional review and approval of assessment services designed, delivered, or assessed by third-party providers; and

5. periodic assessment of the effectiveness of assessment processes utilized by the institution for the improvement of educational effectiveness.

(Source: <https://www.msche.org/publications/RevisedStandardsFINAL.pdf>)

Under PDMA, the University will also use PDMA's New Product Development Professional (NPDP) Certification to assess student achievement of the learning outcomes in the program. The NPDP Certification requires the student to master the PDMA's Body of Knowledge.

## **PDMA New Product Development Professional (NPDP) Certification Body of Knowledge Areas**



### **Strategy**

The Strategy [Body of Knowledge Area]...covers various types of strategy, from corporate through business and functional strategies. An emphasis is placed on the innovation strategy, particularly as it sets out the framework, and provides direction, for product development. The benefits and limitations of specific innovation strategic frameworks are discussed. The role of supporting strategies from technology, marketing, platforms, intellectual property, and capability are presented, both as being directed by higher level business strategy and in their mutual contribution to the overall business strategy.

### **Portfolio Management**

The Portfolio Management [Body of Knowledge Area]...relates strategy to project selection. A product portfolio is defined as the set of current and potential new products that can form the basis for a program of product development, including product improvement, cost reductions, line extension and new company products. Methods for project selection are presented, both as a means of assessing project potential and of achieving strategic alignment with regards individual project prioritization and balance across specific categories of product development. Portfolio management is presented as a cross- functional activity that encompasses the development of new products through to launch, and the on-going review of existing products to ensure optimal alignment with strategy and resource availability.

### **New Products Process**

Rapid changes in technology, communication, and market demands have placed considerable pressure on companies to become more effective and efficient in their product development. Greater understanding of the success factors for new product development has resulted in the application of a range of new product processes to specific contexts. The New Products Process [Body of Knowledge Area]...outlines many of these processes, including Stage-Gate®, Concurrent Engineering, Integrated Product Development, Lean and Agile. The benefits and limitations of each process are discussed

and specific contexts for application are recommended...reference is [also] made to the tools and metrics that are required to underpin a successful new products process.

### **Culture, Organizations, and Teams**

It is widely recognized that new product development cannot be successful through good processes alone. Success is dependent on people, on the culture of the company and the environment that is created to foster innovation. The Culture, Organizations, and Teams [Body of Knowledge Area]...outlines the characteristics of an innovative culture. It also focuses on the requirements for a high performing team and for team structures to support cross-functional teams in an innovative environment and in different project contexts. Management roles and responsibilities at various levels and within different stages of product development are also discussed.

### **Tools and Metrics**

A wide range of tools is required at all levels of product development – strategy formation, portfolio management, new product process, design, life cycle management, etc. Some of these tools are applicable across a range of industries and products, while others are more specific in their application. The Tools and Metrics [Body of Knowledge Area]...focuses on descriptions of a set of generic tools including ideation, financial analysis, quality function deployment, TRIZ, Six Sigma, project management, and risk management. The discussion of the various tools is intended to provide their potential application and value to product development and Product Development. It is not possible to provide detailed explanations on how to apply the various tools, and direction is provided to further reference sources for those who are seeking a more in-depth understanding. Performance metrics are also discussed in this chapter with a strong emphasis on the application of metrics for learning and continuous improvement.

### **Market Research**

Market research is required to provide market-related information and data to underpin decision-making in all aspects of strategy development, portfolio management, the new products process and life cycle management. Certain market research techniques are more appropriate for specific purposes, for example, exploratory customer needs analysis, product concept testing and product sales potential. The application of market research extends across the full cycle of product development, from initial idea generation to final product launch and post-launch reviews. The Market Research [Body of Knowledge Area]...covers a range of market research tools including secondary research, qualitative vs. quantitative, focus groups, customer site visits, ethnography, consumer panels, social media, big data, crowdsourcing, Alpha and Beta testing, and market testing. The benefits and limitations of each tool are discussed together with their potential application at various stages of the new product process. Specific emphasis is placed on the accuracy and reliability of the various tools, and in turn, their value in decision making at various stages of product development.

### **Life Cycle Management**

The Life Cycle Management [Body of Knowledge Area]...is divided into two parts. The first part addresses the product life cycle. It outlines the stages of the product life cycle – introduction, growth, maturity and decline, and discusses Product Development and product development strategies for each stage. Significant emphasis is placed on a



discussion of the introduction stage of the life cycle, with reference to case study examples. The second part...is devoted to sustainability with specific emphasis on sustainable innovation as it is applied to both the innovation strategy and to product design.

(Source: [https://www.pdma.org/page/NPDP\\_body\\_knowledge](https://www.pdma.org/page/NPDP_body_knowledge))

The NPDP Certification is an internationally recognized distinction. The PDMA is a not-for-profit organization of internationally recognized academic and professional experts. The PDMA serves as the source of knowledge in the field of product development, product and innovation management. NPDP Certification formally recognizes mastery, leadership, and success as a product professional.

**b) Document student achievement of learning outcomes in the program**

The University will document student achievement of the learning outcomes in the **MS in Cyber Product Development** program in the same fashion as its current programs.

**4. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements.**

*Program description, as it will appear in the catalog:*

The **Master of Science (M.S.) in Cyber Product Development** provides students with the opportunity to conduct extensive and sustained original research at an advanced level in the field of Product Development. Product Development has evolved recently to a hybrid of scientific reasoning and research, business management, cutting-edge technology, operational analysis, marketing, supply, logistics, and sustainability. The **MS in Cyber Product Development** is a unique master's degree program designed to meet the demands of the highly skilled professionals who want to become the leaders who will be involved in the advancement, expansion, and support of Product Development on both a large and small scale.

The **MS in Cyber Product Development** is for current professionals in the field who desire to increase their skills to an advanced level and become leaders in Product Development. The **MS in Cyber Product Development** also provides a path for personnel in the Product Development field to explore new ground as this section of the industry faces revolutionary changes in highly competitive local, national, and global markets.

*Description of program requirements:*

Entrance Requirements

To be accepted into the program, students must have completed an undergraduate degree with a cumulative GPA of no less than 3.0 on a 4.0 scale.

Students who have not met the 3.0 undergraduate cumulative GPA requirements, or do not meet all the program-specific prerequisites, are provided an opportunity to gain full acceptance. Depending on the degree program, additional information may be requested. In this case, students are provisionally admitted and limited to three courses of enrollment. To achieve full acceptance, provisional students must maintain a 3.0 cumulative GPA in their first three graduate courses.

Upon doing so, students are automatically converted to full acceptance status. If a provisional student fails to achieve a minimum 3.0 cumulative GPA after completing three courses, then he or she will be academically dismissed and will not be permitted to enroll in any further classes.

*Degree Course Requirements:*

The following is a list of courses for the **MS in Cyber Product Development** degree. Students must meet all prerequisites for the courses listed below.

**Master of Science in Product Development  
Courses  
Total Credits: 33**

***PRODUCT DEVELOPMENT CORE COURSES: 33 CREDITS***

**IAE-500 Introduction to Information Assurance (3 Credits)**

This course will provide the requisite computer, data communications, Internet and database skills to students embarking on careers in information assurance, at the senior levels. It is designed primarily for professionals who seek concentrated professional education in one or more of the many fields associated with IA. Students who complete this course successfully will be able to master the more technical application and analysis skills demanded by the Master of Science in Cybersecurity degree program, and the several certificate programs offered in various IA concentrations. Labs, simulations and special problems will be used throughout the course. (3) NOTE: Students enrolled in this course incur an additional lab fee of \$100

**CS-620 Operating Principles for Information Assurance (3 credits)**

This course is an overview of the UNIX operating system. The content will include shell programming, process management, processor management, storage management, scheduling algorithms, resource protection and system programming. The course will include programming projects focused on Information Assurance problem solving utilizing the C programming language primarily. Students are expected to be familiar with virtual machines, the UNIX command line and a basic programming language. Basic knowledge of C programming and UNIX helpful.

**IAE-685 Principles of Cyber Security (3 credits)**

This class explores the overarching security architectures and vectors of information assurance from a management perspective to allow the learner to formulate the basis for sound business decisions. Students gain an appreciation for systems, networks, processes, methodologies, documentation requirements, recovery processes, certification and accreditation processes as well as “best practice” implementation, training and continuous improvement. Discussions in this course give the correct acumen of personnel security, physical security, and technical operational security as these principles relate and interface with information security principles. Defense-in-depth principles also are covered for designing proper physical security programs. At the

completion of the course students should be able to manage an IA function and evaluate an organization's Contingency Planning process for adequacy.

### **IAE-679 Vulnerability Mitigation (3 credits)**

This "Defense-in-Depth" course provides the student detailed understanding of the need for internal and external vulnerability assessment. An integral technical part of any risk management program. Prerequisite CS-620 or waiver. Co-requisites: IAE-685.

### **PRM-(Leveler) Fundamentals of Product Development and Management (3 Credits)**

In this advanced graduate-level course, students will dive into the multifaceted world of product development and management, getting a full grasp of the product lifecycle. Built on foundational principles, the course seamlessly combines market research techniques, innovative strategies, hands-on product development processes, and metric-driven evaluations. As students uncover the essential role of a product manager, they'll learn the intricacies of market conditions, the importance of creating standout products, and the art of product innovation. They'll also familiarize themselves with various product development models such as Stage-Gate, IPD, Waterfall, Agile, Lean, and Design Thinking, alongside the dynamics of software and UX design processes, ensuring they're equipped to collaborate effectively across teams. Beyond this, students will get hands-on experience with a range of tools crucial for product development and will understand how to apply performance metrics to drive action and continuous improvement. Through a blend of online modules, case studies, group projects, and real-world examples, students will be ready to navigate the challenges of product development, championing both product success and customer satisfaction.

### **PRM-540 Leveraging Expert Systems, Big Data, and Business Analytics for Product Development (3 Credits)**

This course focuses on Expert Systems, Big Data, and Business Analytics within the context of Product Development. The student's knowledge base will expand through an exploration of the role of Expert Systems in product development and lifecycle management. The student will also demonstrate how the Product Manager can apply Big Data and Business Analytics to help improve product competitiveness and find new opportunities. Prerequisite: PRM-Leveler.

### **PRM-600 Designing and Developing Great Products (3 Credits)**

Students will design a new product in this course. The student will develop prototypes of increasing precision. The student will evaluate design feedback from customers and continue improving their product. During the process, students will also analyze a range of development issues and best practices, including the use of sprints, establishment of appropriate infrastructure, progress tracking, and working with remote and third-party teams. Prerequisite: PRM-540.

### **PRM-610 Managing the Life of a Product (3 Credits)**

This course will prepare the student for a product launch through close coordination with key departments like marketing, operations, sales, and quality assurance. The student will build up to an effective product launch, and then learn how to track and manage the product in the market after launch. The student will focus on collaboration to ensure appropriate growth in product features as well as market viability. Finally, the student will analyze the decisions and steps needed when "sunsetting" a product at the end of its life cycle. Prerequisite: PRM-600.

### **PRM-625 Product Development Culture, Organizations, and Teams (3 Credits)**

Product Development success depends on the people, culture, and environment of a company that is created to foster innovation. Technology has created new opportunities for Product Development businesses and organizations. This course focuses on the characteristics of an innovative culture, requirements for a high performing team, structures to support cross-functional teams, and different project contexts. Students will also explore the roles and responsibilities at various levels and within different stages of product development. Cases will be analyzed to examine common Product Development problems in technology-driven organizations. Prerequisite: PRM-610.

### **PRM-635 Technology-Enabled Product Development Operations (3 Credits)**

This course will prepare you to contribute effectively to today's technology-enabled Product Development workplace by understanding how to leverage processes, systems, and data to create business value. Students will examine Product Development operations in traditional companies, between firms, and in digital businesses. Students will analyze the perspectives and needs of both start-ups and established Product Development organizations. Prerequisite: PRM-610.

### **PRM-700 Product Development Capstone (3 Credits)**

The Product Development Capstone is the culminating effort of the student's entire learning experience. The student will prepare for and take the Product Development and Management Association's New Product Development Professional (NPDP) Certification exam to demonstrate mastery of the PDMA Body of Knowledge and the Program Outcomes. The student will also complete a master's level thesis research project (with the submission of a final report, approval by a thesis committee, and an oral defense of the research work) or a comprehensive Product Development project. Students will choose either the thesis research or Product Development project option. The Capstone Course must be taken at the end of the student's degree program. Prerequisites: All PRM degree program courses prior to PRM-700.

#### **5. Discuss how general education requirements will be met, if applicable.**

N/A. This is a graduate program.

#### **6. Identify any specialized accreditation or graduate certification requirements for this program and its students.**

The program will be accredited regionally by Middle States Commission on Higher Education (MSCHE). Students will also receive the New Product Development Professional (NPDP) Certification from the Product Development and Management Association (PDMA) by achieving a qualifying score on the certification exam. Capitol Technology University is accredited by MSCHE and is in good standing with all of its specialized accreditation organizations.

#### **7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.**

The University will not be contracting with another institution or non-collegiate organization.

#### **8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree**

**requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.**

The **MS in Cyber Product Development** program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, Learning Management System, availability of academic support services and financial aid resources, and costs and payment policies.

Curriculum, course, and degree information will be available on the university website and via e-mail as well as regular mail (by request). The expectations for faculty/student interaction are available to students during virtual open house events, literature, website, etc. This information is also part of the material distributed for each course. Students receive guidance on proper behavior/interaction with the Director of Graduate Programs and faculty members both in-person and online to facilitate a high-level experience. Technology competence, skills, and technical equipment requirements are part of the material distributed for each course. The technical equipment requirements are also listed on our website and provided to students in the welcome package.

The University's academic support services, financial aid resources, costs and payment policies, and Learning Management System are covered in the University Open Houses, the application process, the Welcome Aboard process, Orientation, Student Town Halls, and individual counseling.

- 9. Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.**

The **MS in Cyber Product Development** program's advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available. The content for every new program is derived from the new program request sent to the Maryland Higher Education Commission is the source of the content for every new program at the University.

#### **H. Adequacy of Articulation:**

- 1. If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements.**

This program does not currently have articulation partners. However, the articulation process will work as it does for the University's current degrees. The University is very active with its transfer partners throughout the state and beyond. The goal of the University is to work with partners to make the transfer as seamless as possible and to maximize the student's transfer credits as possible. There are University transfer admissions personnel to guide the student through the process.

#### **I. Adequacy of Faculty Resources (as outlined in COMAR 13B.02.03.11):**

- 1. Provide a brief narrative demonstrating the quality of the program faculty. Include a**



**summary list of the faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach.**

All faculty listed below have been engaged with the University for at least several years. Dr. Abu-Ageel, ~~Dr. Bajracharya~~, ~~Dr. Bajwa~~, Dr. Butler, and Dr. McAndrew are full-time faculty members. All of the faculty members hold terminal degrees. All faculty have product development and Product Development experience. The University leadership is confident in the quality of the faculty and their abilities to provide a learning environment supportive of the University goals for student success. Additional faculty will be added as needed.

Instructors for the **MS in Cyber Product Development** are:

<b>INSTRUCTOR</b>	<b>BACKGROUND</b>	<b>COURSES ALIGNED TO BE TAUGHT</b>
Dr. Nayef Abu-Ageel Part time	Ph.D. Electrical and Computer Engineering M.S. Electrical Engineering B.S. Electrical Engineering	PRM- 600, PRM-610, PRM-700
Dr. Kellep Charles Full time Chair: Cyber Security	DSc Cyber Security MS Telecommunication Management BS Computer Science	All IAE and the CS course in the program
Dr. Hasna Banu Adjunct	Ph.D. Theoretical Physics M.S. Mathematics B.S. Mathematics	PRM-700
Dr. William Butler Full time	D.Sc. Cyber Security M.S. Strategic Studies B.S. Computer Science NSTISSI No. 4011 CNSSI No. 4012 NSTISSI No. 4015 CNSSI No. 4016	PRM-540, PRM-700, CS-620
Dr. Andrew Carruthers Adjunct	Ph.D. Engineering M.S. Engineering Management B.S. Engineering Technology	PRM- 600, PRM-610, PRM-700

Dr. Ian McAndrew Full time	Ph.D. Mechanical Engineering M.Sc. Manufacturing Engineering M.A. Education Management Post-Graduate Diploma in Education B.Sc. (Hons) Mechanical Engineering B.A. Production Engineering Technical Qualifications (Associate Degrees) Higher National Certificate, HNC, in Mechanical Engineering Higher National Diploma, HND, in Production Engineering System Safety in Occupational Hygiene and Safety – HAS Courses City and Guilds 200, 205 II & III (all distinctions – highest grade ever achieved in Ford’s Training Scheme) Apprentice Toolmaker 1977 – 1981 (Distinction)	All PRM courses
Dr. Jeremy Pretty Adjunct	Ph.D. Product Development M.S. Project Management Master of Aeronautical Science in Aviation Management and Safety BS, Professional Aeronautics, Management and Safety PMP, Project Management Professional, PMI PMI-ACP, Agile Certified Practitioner, PMI PMI-SP, Scheduling Professional, PMI CSPO, Certified Scrum Product Owner, Scrum Alliance CSM, Certified Scrum Master, Scrum Alliance Certificate in Agile Contract Management	All PRM courses

Note: Additional qualified faculty with an appropriate doctorate and experience will be added in the near future. As demonstrated in the list of faculty resources above, Capitol Technology will employ a multidisciplinary group of faculty in this hybrid program.

## 2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:

### a) Pedagogy that meets the needs of the students

The primary pedagogy for faculty at Capitol Technology University is the Active Learning model. The university believes strongly in a highly-interactive, thinking, and hands-on experience for students in each class to the maximum extent possible.

It was two Missouri State professors, historian Charles Bonwell and psychologist James Eison, who coined the term "active learning." In their 1991 book on the subject, *Active Learning: Creating Excitement in the Classroom*, they offered this definition of the concept: "active learning involves students in doing things and thinking about the things they are doing."

The definition, though it seems circuitous, marks a definitive pedagogical shift in college teaching and learning. Rather than think about what they are watching, hearing, or

reading, students are first encouraged to be "doing" something in class, and then to apply critical thought and reflection to their own classroom work and activity. Their argument was backed up by research. Even Bligh, 20 years earlier, had pointed out that the immediate rehearsal of new information and knowledge had a significant impact on learning.

This approach is as helpful in the sciences as it is in the arts or humanities: whether it's organic chemistry, creative writing, or behavioral economics, concepts are all best understood through repeated practice and open, social exploration. The central tenet of active learning is that practice matters, and that classroom time is better spent giving students opportunities to work with concepts over and over, in a variety of ways and with opportunities.

The central tenet of active learning — that practice and interaction matters— can be applied across disciplines for immediate feedback, so that knowledge can take hold in their own minds.

(Source: Preville, P. Active Learning: The Perfect Pedagogy for the Digital Classroom: An Essential Guide for the Modern Professor)

All faculty receive regular periodic and recurring pedagogical training during the academic year. Those training sessions occur in a hybrid format – simultaneously live online and live on-ground in the classroom. The sessions are designed to reach all faculty, both fulltime and adjunct, in order to ensure everyone receives the training. Additionally, the sessions are recorded for those faculty who are unable to attend the live training session due to other professional and teaching commitments.

## **b) The Learning Management System**

The University's Department of Online Learning and Information Technology Division supports the online program needs of faculty and students. The Department of Online Learning and IT Help Desk provide 24-hour support to the faculty. Canvas is the University's online Learning Management System. When a new faculty member is assigned to teach an online course, the Department of Online Learning provides formal training for the instructor. New faculty are assigned an experienced faculty mentor to ensure a smooth transition to the online environment as well as to ensure compliance with the institution's online teaching pedagogy. The University believes this provides the highest-level learning experience for the faculty member and, in turn, students attending online classes.

## **c) Evidenced-based best practices for distance education, if distance education is offered.**

Faculty at Capitol Technology University receive training in Keller's ARCS Motivational Model and his associated strategies for distance education/online learning.

A model used in the online delivery of teaching and learning to increase learner motivation is Keller's ARCS motivational model. This model has been considered an important element in online education because of its implications on increased learner motivation and learning outcomes. The Keller's model consists of motivating students by maintaining and eliciting attention (A), such as virtual clinical simulations; making the content and format relevant (R), by modeling enthusiasm or relating content to future use; facilitating student confidence (C), by providing "just the right challenge"; and promoting learner satisfaction (S), by providing reinforcement and praise when appropriate. Examples of Keller's model include increasing motivation including the arousal of curiosity of students, making the connection between learning objectives and future learning goals, autonomous thinking and learning, and fostering student satisfaction. Keller's ARCS model has been researched by various educational online programs to analyze student motivation and learning outcomes. Keller's model serves as an example and guide for instructors to motivate and increase online engagement with their students as well as research purposes.

A qualitative study by Chan Lin investigated online student learning and motivation. Discussion boards, student projects, and reflection data were collected and analyzed from a 12-week web-based course. Respondents indicated the importance of online feedback from the instructor and peer modeling of course tasks to visualize learning progress. The study revealed using Keller's ARCS strategies fosters greater student online engagement by fostering self-efficacy and a sense of accomplishment.

In a mixed-method study, assessing the use of Keller's ARCS on instructional design, the use of educational scaffolding fostered positive levels of student motivation. Relevancy, attention, confidence, and satisfaction were all common factors associated with student success in the course and course completion.

(Source: Pinchevsky-Font T, Dunbar S. Best Practices for Online Teaching and Learning in Health Care Related Programs. The Internet Journal of Allied Health Sciences and Practice. January 2015. Volume 13 Number 1.)

All faculty receive regular periodic and recurring training on evidence-based practices for distance education/online learning during the academic year. Those training sessions occur in multiple formats: asynchronous, synchronous (i.e., live online), hybrid (i.e., simultaneously live online and live on-ground), and on-ground in the classroom. The sessions are designed to reach all faculty, both fulltime and adjunct, to ensure all members receive the training. Additionally, the live sessions are recorded for those faculty who are unable to attend the live training session due to other professional commitments or who are teaching classes at the training delivery time.

**J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12):**

- 1. Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program. If the program is to be implemented within existing institutional resources, include a supportive statement by the President for library resources to meet the program's needs.**

*Library Services:* The Puente Library offers extensive services and a wide collection for Capitol Technology University students to be academically successful. Library resources are available digitally. The library also provides a mailing service for materials borrowed through the Maryland system.

The library is currently supporting the following degrees at the undergraduate level: B.S. in Astronautical Engineering, B.S. in Aviation Professional Pilot, B.S. in Computer Engineering, B.S. in Computer Engineering Technology, B.S. in Computer Science, B.S. in Construction Information Technology and Cybersecurity, B.S. in Construction Management and Critical Infrastructure, B.S. in Construction Safety, B.S. in Counterterrorism, B.S. in Cyber Analytics, B.S. in Cybersecurity, B.S. in Data Science, B.S. in Electrical Engineering, B.S. in Electrical Engineering Technology, B.S. in Engineering Technology, B.S. in Facilities Management and Critical Infrastructure, B.S. in Information Technology, B.S. in Management of Cyber and Information Technology, B.S. in Mechatronics Engineering, B.S. in Mechatronics and Robotics Engineering Technology, B.S. in Software Engineering, and B.S. in Technology and Business Management, B.S. in Unmanned and Autonomous Systems, and B.S. in Web Development.

The library is currently supporting the following degrees at the graduate level: Master of Business Administration (M.B.A.), Master of Science (M.S.) in Astronautical Engineering, M.S. in Aviation, M.S. in Aviation Cybersecurity, M.S. in Computer Science, M.S. in Construction Cybersecurity, M.S. in Construction Safety, M.S. in Critical Infrastructure, M.S. in Cyber Analytics, M.S. in Cybersecurity, M.S. in Information Systems Management, M.S. in Engineering Technology, M.S. in Internet Engineering, M.S. in Unmanned and Autonomous Systems Policy and Risk Management, Technical Master of Business Administration (T.M.B.A.) in Business Analytics and Data Science, and T.M.B.A. in Cybersecurity, Doctor of Science (D.Sc.) in Cybersecurity, Doctor of Philosophy (Ph.D.) in Artificial Intelligence, Ph.D. in Aviation, Ph.D. in Business Analytics and Data Sciences, Ph.D. in Construction Science, Ph.D. in Critical Infrastructure, Ph.D. in Cybersecurity Leadership, Ph.D. in Emergency and Protective Services, Ph.D. in Human Factors, Ph.D. in Manufacturing, Ph.D. in Occupational Health and Safety, Ph.D. in Product Development, Ph.D. in Quantum Computing, Ph.D. in Technology, Ph.D. in Technology/M.S. Research Methods Combination Program, Ph.D. in Unmanned Systems Applications.

Therefore, the library is fully prepared to support a **MS in Cyber Product Development**.

Services provided to online students include:

- "Ask the Librarian"
- Research Guides
- Tutorials
- Videos
- Online borrowing

The John G. and Beverley A. Puente Library provides access to management, decision science, and research methods materials through its 10,000-title book collection, e-books, and its 90 journal subscriptions. The library will continue to purchase new and additional materials in the management, decision science, and research methods area to maintain a strong and current collection in the subject area. Students can also access documents through the library's participation in Maryland's Digital eLibrary Consortium. This online electronic service provides access to numerous databases (Access Science, NetLibrary) that supply students with the documents they need. Available databases include ProQuest, EBSCO, ACM, Lexis Nexis, Taylor Francis, and Sage Publications.

The Puente Library can provide access to historical management and decision science materials through its membership in the Maryland Independent College and University Association (MICUA) and the American Society of Engineering Education (ASEE). Reciprocal loan agreements with fellow members of these organizations provide the library access to numerous research facilities that house and maintain archives of management and decision science documents. The proximity of the University of Maryland, College Park, and other local area research and academic libraries provide the Puente Library with quick access to these materials as well.

The library currently supports the needs of students at the undergraduate, masters, and doctoral levels.

**K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13):**

- 1. Provide an assurance that the physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President regarding adequate equipment and facilities to meet the program's needs.**

No new facilities are required for the program. The online class platform is web-based and requires no additional equipment for the institution. The current Learning Management System, Canvas, and Zoom meet the needs of the degree program. The Business and Technology Lab, Computer Science Lab, Cyber Lab, Robotics Lab, and Unmanned Systems Lab meet the potential research needs of the students. The labs provide both local and virtual support.

**2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:**

**a) An institutional electronic mailing system**

Capitol Technology University provides an institutional electronic mailing system to all students and faculty. The University requires the use of the email system by all students and faculty in all the institution's modalities of course delivery. Capitol Technology University students and faculty are required to use the institution's email addresses (e.g., xxxxxxxx@captechu.edu) in all University matters and communications. The University uses the email capabilities in Microsoft Office 365 and Microsoft Outlook.

**b) A learning management system that provides the necessary technological support for distance education**

Capitol Technology University provides a robust Learning Management Systems (LMS) through the use of the Canvas LMS by Instructure ([www.canvaslms.com](http://www.canvaslms.com)). The University pairs Canvas with Zoom ([zoom.us](http://zoom.us)) to provide a platform for every student and faculty member to meet face-to-face in a synchronous "live" mode of communication. The University requires Canvas for every class; as a result, every course has a classroom on Canvas and Zoom. All syllabi, grades, and assignments must be entered into Canvas on a timely basis throughout the semester.

Canvas provides the world's most robust LMS. It is a 21st Century LMS; Canvas is a native cloud, Amazon Web Service hosted system. The system is adaptable, reliable, and customizable. Canvas is easy to use for students and faculty. The system is fully mobile and has proven to be timesaving when compared to other systems. The following list provides the features of the system:

Time and Effort Savings

- **CANVAS DATA**  
Canvas Data parses and aggregates more than 280 million rows of Canvas usage data generated daily.
- **CANVAS COMMONS**  
Canvas Commons makes sharing a whole lot easier.
- **SPEEDGRADER ANNOTATIONS**  
Preview student submissions and provide feedback all in one frame.
- **GRAPHIC ANALYTICS REPORTING ENGINE**  
Canvas Analytics helps you turn rich learner data into meaningful insights to improve teaching and learning.
- **INTEGRATED MEDIA RECORDER**  
Record audio and video messages within Canvas.
- **OUTCOMES**  
Connect each learning outcome to a specific goal, so results are demonstrated in clearly measurable ways.

- **MOBILE ANNOTATION**  
Open, annotate, and submit assignments directly within the Canvas mobile app.
- **AUTOMATED TASKS**  
Course management is fast and easy with automated tasks.
- **NOTIFICATION PREFERENCES**  
Receive course updates when and where you want - by email, text message, even Twitter or LinkedIn.
- **EASE OF USE**  
A familiar, intuitive interface means most users already have the skills they need to navigate, learn, and use Canvas.
- **IOS AND ANDROID**  
Engage students in learning anytime, anywhere from any computer or mobile device with a Web-standard browser.
- **USER-CUSTOMIZABLE NAVIGATION**  
Canvas intelligently adds course navigation links as teachers create courses.
- **RSS SUPPORT**  
Pull feeds from external sites into courses and push out secure feeds for all course activities.
- **DOWNLOAD AND UPLOAD FILES**  
Work in Canvas or work offline—it's up to you.
- **SPEEDGRADER**  
Grade assignments in half the time.

#### Student Engagement

- **ROBUST COURSE NOTIFICATIONS**  
Receive course updates when and where you want—by email, text message, and even Facebook.
- **PROFILE**  
Introduce yourself to classmates with a Canvas profile.
- **AUDIO AND VIDEO MESSAGES**  
Give better feedback and help students feel more connected with audio and video messages.
- **MULTIMEDIA INTEGRATIONS**  
Insert audio, video, text, images, and more at every learning contact point.
- **EMPOWER GROUPS WITH COLLABORATIVE WORKSPACES**  
By using the right technologies in the right ways, Canvas makes working together easier than ever.
- **MOBILE**



Engage students in learning anytime, anywhere from iOS or Android, or any mobile device with a Web-standard browser.

- **TURN STUDENTS INTO CREATORS**  
Students can create and share audio, video, and more within assignments, discussions, and collaborative workspaces.
- **WEB CONFERENCING**  
Engage in synchronous online communication.
- **OPEN API**  
With its open API, Canvas easily integrates with your IT ecosystem.
- **BROWSER SUPPORT**  
Connect to Canvas from any Web-standard browser.
- **LTI INTEGRATIONS**  
Use the tools you want with LTI integrations.
- **MODERN WEB STANDARDS**  
Canvas is built using the same Web technologies that power sites like Google, Facebook, and Twitter.

#### Lossless Learning

- **CANVAS POLLS**  
Gauge comprehension and incorporate formative assessment without the need for "clicker" devices.
- **MAGICMARKER**  
Track in real-time how students are performing and demonstrating their learning.
- **QUIZ STATS**  
Analyze and improve individual assessments and quiz questions.
- **LEARNING MASTERY FOR STUDENTS**  
Empower students to take control of their learning.

(Source: <https://www.canvaslms.com/higher-education/features>)

Capitol Technology University has been using Canvas for over five years. Canvas has proven to be a wholly reliable LMS system that provides the necessary technological support for distance education/online learning.

**L. Adequacy of Financial Resources with Documentation (as outlined in COMAR13B.02.03.14):**

**1. Table 1: Resources.**

**TABLE 1: RESOURCES**

<b>Resource Categories</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
1. Reallocated Funds	\$0	\$0	\$0	\$0	\$0
2. Tuition/Fee Revenue (c + g below)	\$192,780	\$383,724	\$583,884	\$794,430	\$1,014,768
a. Number of F/T Students	0	0	0	0	0
b. Annual tuition/Fee rate	\$0	\$0	\$0	\$0	\$0
c. Total F/T Revenue (a x b)	\$0	\$0	\$0	\$0	\$0
d. Number of P/T Students	17	33	49	65	81
e. Credit Hour Rate	\$630	\$646	\$662	\$679	\$696
f. Annual Credit Hour	18	18	18	18	18
g. Total P/T Revenue (d x e x f)	\$192,780	\$383,724	\$583,884	\$794,430	\$1,014,768
3. Grants, Contracts and Other External Sources	0	0	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	\$192,780	\$383,724	\$583,884	\$794,430	\$1,014,768

**A. Provide a narrative rationale for each of the resource categories. If resources have been or will be reallocated to support the proposed program, briefly discuss those funds.**

**1. Reallocated Funds**

The University will not need to reallocate funds for the program.

**2. Tuition and Fee Revenue**

Tuition is calculated to include an annual 2.5% tuition increase. A 20% attrition rate has been calculated.

**3. Grants and Contracts**

There are currently no grants or contracts.

**4. Other Sources**

There are currently no other sources of funds.

**5. Total Year**

No additional explanation or comments needed.

2. Table 2: Expenditure.

**TABLE 2: EXPENDITURES**

<b>Expenditure Category</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
1. Faculty (b + c below)	\$113,468	\$155,071	\$238,421	\$325,843	\$417,486
a. #FTE	1.5	2	3	4	5
b. Total Salary	\$94,557	\$129,226	\$198,684	\$271,536	\$347,905
c. Total Benefits (20% of salaries)	\$18,911	\$25,845	\$39,737	\$54,307	\$69,581
2. Admin Staff (b + c below)	\$5,942	\$6,091	\$6,244	\$6,400	\$6,559
a. #FTE	.08	.08	.08	.08	.08
b. Total Salary	\$4,952	\$5,076	\$5,203	\$5,333	\$5,466
c. Total Benefits	\$990	\$1,015	\$1,041	\$1,067	\$1,093
3. Support Staff (b + c below)	\$59,885	\$92,076	\$125,837	\$161,230	\$198,313
a. #FTE	1.00	1.5	2	2.5	3
b. Total Salary	\$49,905	\$76,730	\$104,864	\$134,358	\$165,261
c. Total Benefits	\$9,980	\$15,346	\$20,973	\$26,872	\$33,052
4. Technical Support and Equipment	\$1,190	\$2,475	\$3,920	\$5,525	\$7,290
5. Library	\$0	\$0	\$0	\$0	\$0
6. New or Renovated Space	\$0	\$0	\$0	\$0	\$0
7. Other Expenses	\$6,630	\$16,170	\$28,910	\$44,850	\$63,990
<b>TOTAL (ADD 1-7)</b>	<b>\$187,115</b>	<b>\$271,883</b>	<b>\$403,332</b>	<b>\$543,848</b>	<b>\$693,638</b>

**A. Provide a narrative rationale for each expenditure category. If expenditures have been or will be reallocated to support the proposed program, briefly discuss those funds.**

**1. Faculty**

Table 2 reflects the faculty hours in total, but this does not necessarily imply that these are new hire requirements.

**2. Administrative Staff**

Capitol Technology University will continue with current the administrative staff through the proposed time period.

**3. Support Staff**

Capitol Technology University will add additional support staff to facilitate the program.

**4. Equipment**

Software for courses is available free to students or is freeware. Additional licenses for the LMS will be purchased by the University at the rate of \$70 per student in Year 1. The rate is estimated to increase by \$5 per year.

**5. Library**

Money has been allocated for additional materials to be added to the on-campus and virtual libraries to ensure the literature remains current and relevant. However, it has been determined that the current material serves the needs of this degree due to the extensive online database.

**6. New or Renovated Space**

No new or renovated space is required.

**7. Other Expenses**

Funds have been allocated for office materials, travel, professional development, course development, marketing, and additional scholarships.

**8. Total Year**

No additional explanation or comments needed.

**M. Adequacy of Provisions for Evaluation of Program (as outlined in COMAR 13B.02.03.15):**

**1. Discuss procedures for evaluating courses, faculty and student learning outcomes.**

The assessment process at the University consists of a series of events throughout the Academic Year. The results of each event are gathered by the University Assessment Team and stored in Canvas for analysis and use in annual reports, assessments, etc. The University Assessment Team analyzes the results, develops any necessary action plans, and monitors the implementation of the action plans.

Academic Year Assessment Events:

Fall Semester:

- At the August Faculty Retreat, the faculty reviews any outstanding student learning challenges that have not been adequately addressed. The issues are brought to the Academic Deans for review and development of implementation plans.
- Faculty submit performance plans consistent with the mission and goals of the University and department. The documents are reviewed and approved by the Academic Deans.
- Department Chairs and Academic Deans review the Graduating Student Survey data.
- Department Chairs and Academic Deans review student internship evaluations.
- Department Chairs and Academic Deans review grade distribution reports from the spring and summer semesters.
- Department Chairs and Academic Deans review student course evaluations from the Summer Semester.
- Departments conduct Industrial Advisory Board meetings to review academic curriculum recommendations. The Advisory Board meets to begin curriculum review or address special issues that may arise related to the curriculum. Based on an analysis and evaluation of the results, the Academic Deans, faculty, and the advisory boards will develop the most effective strategy to move the changes forward.
  - NOTE: A complete curriculum review for degrees occurs every two years. In most cases, the changes only require that the Academic Deans inform the Vice President of Academic Affairs and University President and provide a report that includes a justification and the impact of the changes as well as a strategic plan. Significant changes typically require the approval of the Executive Council.

- The Academic Deans attend the Student Town Hall and review student feedback with Department Chairs.
- Department Chairs conduct interviews with potential employers at our Career Fair.
- Post-residency, the Academic Deans meet with the faculty to review the student learning progress and discuss needed changes.

Spring Semester:

- Faculty Performance Plans are reviewed with faculty to identify issues of divergence and to adjust the plan as needed.
- Department Chairs and Academic Deans review grade distribution reports from the Fall Semester.
- Department Chairs and Academic Deans review the Graduating Student Survey data.
- Department Chairs and Academic Deans review student course evaluations from the Fall Semester and the Spring Semester (in May before the Summer Semester begins).
- Department Chairs and Academic Deans meet to review the content of the graduating student, alumni, and course surveys to ensure the surveys continue to meet the university's assessment needs.
- At the Annual Faculty Summit in May, the faculty review and discuss student learning challenges from the past academic year and provide recommendations to the Academic Deans. The results also lead to implementation plans for improvement.
- Department Chairs conduct interviews with potential employers at our Career Fair.
- Departments conduct Industrial Advisory Board meetings to review academic curriculum recommendations.

In addition to these summative assessments, the Academic Deans meet with the Department Chairs every week to review current student progress. This formative assessment allows for immediate minor changes, which increase faculty effectiveness and, ultimately, student outcomes.

The Faculty Senate meets monthly from August through April. The Faculty Senate addresses issues that impact student outcomes as those issues emerge. The leadership of the Faculty Senate then provides a report on the matter to the Academic Deans. The report may include a recommendation or a request to move forward with a committee to examine the issue further. In most cases, the changes only require the Academic Deans to inform the Vice President of Academic Affairs and University President and provide a report that includes a justification and the impact of changes as well as a strategic plan. Significant changes typically require the approval of the Executive Council.

2. **Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.**

*Student Learning Outcomes:*

Student learning outcomes for the proposed **MS in Cyber Product Development** will be measured using the instruments identified in Section G and Section M as well as the assessment measures dictated by the accreditation requirements of the University's regional accreditor [i.e., Middle States Commission in Higher Education (MSCHE)]. This program is designed to meet the requirements of MSCHE. The University will also evaluate student achievement of the learning

outcomes using the Product Development and Management Association (PDMA) New Product Development Professional (NPDP) certification criteria. The University is in good standing with all its accrediting bodies.

#### *Student Retention:*

The University maintains a comprehensive student retention program under the Vice President for Student Engagement. The program assesses student retention at all levels, including the individual course, major, and degree. During the semester and term, the University's Drop-Out Detective capability, within its Learning Management System (i.e., Canvas), provides an early alert at the course level to potential issues related to retention. Within the Office of Student Life, Academic Advisors monitor Drop-Out Detective and contact students who appear to have problems with their academic performance. The Academic Advisors work with each student to create a plan to remove any barriers to success. The Academic Advisors also work with the course instructors as needed to gain additional insight that may help correct the situation.

Each student also meets with their Academic Advisor each semester to evaluate their progress toward degree completion. An updated plan of action is developed for each student's next semester's registration and each following semester through degree completion.

The Vice President for Student Engagement also meets regularly with the Vice President of Academic Affairs and Academic Deans to review student retention within each degree program and address any issues that appear to be impediments to degree completion.

#### *Student and Faculty Satisfaction:*

Evaluations and assessment of Student and Faculty satisfaction occur every semester. Faculty members are evaluated every semester by students enrolled in their courses. Students are required to complete a course evaluation online within a specified time frame at the end of the semester for every enrolled course, or they are locked out of Canvas (the University's Learning Management System) until they complete each survey. Every faculty member is also required to review each of their courses after each semester; the goal is to ensure up-to-date content, effective, and efficient methods of delivery, and appropriate outcomes.

The Department Chairs and Academic Deans review the student evaluations for every course offered at the University. The Department Chairs and Academic Deans also review faculty satisfaction every semester. If a course requires adjustments, the faculty develops and implements the changes upon approval of the Department Chairs and Academic Deans. If changes are required at the faculty level, the Department Chairs will make the changes. At the end of the following semester, appropriate stakeholders analyze the results of a follow-on evaluation for the effectiveness of the changes. This cycle is an ongoing process.

#### *Cost Effectiveness:*

Based on the yearlong inputs, evaluations, and reviews described in Section M.1, the Department Chairs and Academic Deans prepare the proposed academic budget for each program for the upcoming year. Budget increases are tied to increasing student learning and performance as well as critical strategic initiatives.

The Interim Vice President of Finance and Administration also monitors each academic program throughout every semester and term for its cost-effectiveness. Additionally, the revenue and costs

of every University program are reviewed annually by the Executive Council and Board of Trustees before approving the next year's budget.

**N. Consistency with the State's Minority Student Achievement goals (as outlined in COMAR 13B.02.03.05 and the State Plan for Post-Secondary Education):**

- 1. Discuss how the proposed program addresses minority student access & success, and the institution's cultural diversity goals and initiatives.**

Capitol Technology University is a majority-minority school. Our programs attract a diverse set of students who are multiethnic and multicultural. The University actively recruits minority populations for all undergraduate and graduate-level degrees. Special attention is also provided to recruit females into the STEM and multidisciplinary programs at all degree levels – undergraduate, master's, and doctoral. The University will use the same approach for the **MS in Cyber Product Development**.

**O. Relationship to Low Productivity Programs Identified by the Commission:**

- 1. If the proposed program is directly related to an identified low productivity program, discuss how the fiscal resources (including faculty, administration, library resources, and general operating expenses) may be redistributed to this program.**

This program is not associated with a low productivity program identified by the Commission.

**P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)**

- 1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.**

Capitol Technology University is fully eligible to provide distance education. The University has a long history of providing high-quality distance education. The University is accredited regionally by the Middle States Commission in Higher Education (MSCHE) and through four specialized accrediting organizations: International Accreditation Council of Business Education (IACBE), Accreditation Board for Engineering and Technology (ABET), NSA, and DHS. All five accrediting organizations have reviewed the University's distance education program as part of their accreditation process. Capitol Technology University is fully accredited by MSCHE, IACBE, ABET, NSA, and DHS. The University is in good standing with all its accrediting bodies.

- 2. Provide assurance and any appropriate evidence that the institution complies with the C-RAC guidelines, particularly as it relates to the proposed program.**

Capitol Technology University has a long history of providing high-quality distance education/online learning that complies with the Council of Regional Accrediting Commissions (C-RAC) Interregional Guidelines for the Evaluation of Distance Education. The University will also continue to abide by the C-RAC guidelines with the proposed **MS in Cyber Product Development**.

- a. Council of Regional Accrediting Commissions (C-RAC) Interregional Guidelines for the Evaluation of Distance Education.**

**1. Online learning is appropriate to the institution's mission and purposes.**

Online learning is consistent with the institution's mission, purpose, and history. Please refer to Section A of this proposal.

**2. The institution's plans for developing, sustaining, and, if appropriate, expanding online learning offerings are integrated into its regular planning and evaluation processes.**

All programs at the University – online, hybrid, and on-ground – are subject to the same regular planning, assessment, and evaluation processes. Please see Section M of this proposal for the detailed process.

**3. Online learning is incorporated into the institution's systems of governance and academic oversight.**

All programs at the University – online, hybrid, and on-ground – are subject to the same regular planning, assessment, and evaluation processes. Please see Section M of this proposal for the detailed process.

**4. Curricula for the institution's online learning offerings are coherent, cohesive, and comparable in academic rigor to programs offered in traditional instructional formats.**

Online programs/courses meet the same accreditation standards, goals, objectives, and outcomes as traditional instruction at the University. The online course development process incorporated the Quality Matters research-based set of standards for quality online course design to ensure academic rigor of the online course is comparable to the traditionally offered course. The University Academic Deans, chairs, and faculty review curriculum annually. Courses are reviewed at the end of each term of course delivery. This process applies to online and traditional classes. In addition, advisory boards are engaged in the monitoring of course quality to ensure quality standards are met regardless of the delivery platform.

**5. The institution evaluates the effectiveness of its online learning offerings, including the extent to which the online learning goals are achieved, and uses the results of its evaluations to enhance the attainment of the goals.**

Online programs/courses meet the same accreditation standards, goals, objectives, and outcomes as traditional classroom delivery. The University selects the learning platforms to ensure the high standards of the technical elements of each course. The Academic Deans monitor any course conversion from in-class to online to ensure the online course is academically equivalent to the traditionally offered course and that the technology is appropriate to support the expected rigor and breadth of the course.

**6. Faculty responsible for delivering the online learning curricula and evaluating the students' success in achieving the online learning goals are appropriately qualified and effectively supported.**



The Department of Master's Programs, where this degree will be sponsored, is staffed by a qualified University Director, Dr. Eric Motycka, and supported by the faculty. Other appropriately credentialed faculty with multi-disciplinary level skills will be part of the delivery process.

The evaluation of the courses in the program will be performed using the same processes as all other programs at the University. (Please see Section M.) All Capitol Technology University faculty teach in the traditional classroom environment and online. (Please see faculty qualifications in Section I of this document.)

**7. The institution provides effective student and academic services to support students enrolled in online learning offerings.**

Students can receive assistance in using online learning technology via several avenues. Student aides are available to meet with students and provide tutoring support in both subject matter and use of the technology. Tutors are available in live real-time sessions using Zoom or other agreed-upon tools. Pre-recorded online tutorials are also available.

In addition to faculty support, on-ground and online tutoring services are available to students in a one-on-one environment.

Laboratories (on ground and virtual) are available for use by all students. Faculty and highly-qualified tutors staff the laboratories and provide academic support.

Library services and resources are appropriate and adequate. Please refer to Section J of this document and the attached letter from the University President. The library adequately supports the students learning needs.

**8. The institution provides sufficient resources to support and, if appropriate, expand its online learning offerings.**

The University has made the financial commitment to the program. (Please refer to Section L). The University has a proven record of accomplishment in supporting degree completion.

**9. The institution assures the integrity of its online offerings.**

Current faculty serve on internal advisory boards that examine possible for program changes, including course and program development. All faculty are selected on domain expertise and program-related teaching experience.

When new faculty or outside consults are necessary for the design of courses offered, the University's Human Resource Department initiates a rigorous search and screening process to identify appropriate faculty to design and teach online courses. Again, all faculty are selected on domain expertise and program-related teaching experience

The University online platforms offer several avenues to support instructors engaged in online learning. The Director of Online Learning Division is highly skilled and trained in faculty development. Several seminars and online tutorials are available to the faculty every year. Mentors are assigned to new faculty. Best practice sharing is facilitated

through the Academic Deans, Department Chairs, and formal meetings.

The assessment for online learning classes/students is the same as for all academic programs at the University. Faculty provide required data on student achievement. The Learning Management System includes data on student achievement. Proof of these assessments is available during the class and following class completion to the Academic Deans and Department Chairs. On an annual basis, the information is reported to the University's accreditation authorities such as MSCHE and NSA/DHS.